

REMARKS**I. Summary of Amendments:**

Dependent Claims 13, 26, 39 and 52 have been amended to add a limitation which qualifies how the porous material for use in fabricating the mixing tube is selected and how the operating parameters for the electric discharge machining of the mixing tube are selected. The basis for these changes are disclosed on pages 10-11 of the original application.

II. Response To Drawing Objections:

The originally submitted drawings are objected to as needing to have an addition indicating that FIGS. 1-3 pertain to the prior art. Formal drawings, with the requested additions, are herein submitted in replacement of the originally submitted drawings.

III. Response To Claim Rejections:**(A) Rejection of Claims 1-3, 5-12, 14-16, 19-25, 27-29, 32-38, 40-42 and 45-51 Under §102(b) As Being Anticipated By Katz (USPN 5,921,846)**

The Applicants respectfully argues that the Examiner commits clear error in this rejection because:

As suggested by the enclosed Umang Anand Rule 132 Declaration, which is herewith submitted as part of this Response, the Patent Examiner appears to misunderstand the differences between the elements of the abrasive water jet (AWJ) cutting head of the present invention and the elements of the abrasive water suspension jet (AWSJ) cutting head which is the subject of Prof. Katz's USPN 5,921,846, which has been cited as anticipating the present invention. This misunderstanding leads the Examiner to erroneously state that:

(a) the "upstream slurry entry tube or chamber," identified by numeral 2 in Katz's FIG. 1A of a AWSJ, is equivalent to the not-totally-enclosed mixing & entrainment chamber of the present AWJ, which is claimed as "a chamber having an inlet for receiving a pressurized fluid jet, a port for receiving a flow of dry abrasive particles which are entrained into said fluid jet, and an exit

through which said fluid jet and entrained abrasives exit said chamber,” and identify by numeral 10 in FIG. 4 of the present patent application, and

(b) the “nozzle or orifice” identified by numeral 7 in Katz’s FIG. 1A of a AWSJ is equivalent to the focusing or mixing tube of the present AWJ, which is claimed as “a mixing tube having an entry port for receiving said fluid jet and entrained abrasives, an inner wall for directing the flow of said fluid jet and entrained abrasives, and an outlet port through which said fluid jet and entrained abrasives exit said tube, wherein said tube entry port is proximate said chamber exit,” and identify by numeral 20 in FIG. 4 of the present application.

(B) Rejection of Claims 4, 5, 17, 18, 30, 31, 43 and 44 Under §103(a) As Being Obvious Over Katz

The Applicants respectfully argues that the Examiner commits clear error in this rejection because:

As suggested by the enclosed Umang Anand Rule 132 Declaration, the Patent Examiner appears to fail to appreciate the amount of experimental and theoretical research that was required to identify the ranges of the limitations cited in these Claims. Thus, if the Examiner had better appreciated the novelty of the unique limitations of these claims, this §103(a) rejection would not have been given.

As Dr. Anand notes in paragraph 8 of his Declaration “the ratio of lubricating fluid to carrier fluid kinematic viscosity being in the range of 100/1 - 40,000/1, and the ratio of the flow rate of lubricating fluid to that of an abrasive fluid jet being in the range of 1/10,000 - 1/20 are “not obvious numbers and routine skill in the art.” The nonobviousness of these ratios is clearly seen in Fig. 24 and the discussion that appears on pages 176-179 of my paper entitled “Prevention of Nozzle Wear In Abrasive Water Suspension Jets (AWSJ) Using Porous Lubricated Nozzles” which was published in the ASME Journal of Tribology, vol. 125(1), pp. 168-180, January 2003, a copy of which is included with this Declaration. The text within these cited pages of this distinguished research journal clearly discloses my research findings that very high viscosity lubricants are required and indications are given of the range of lubricant flow rates required to prevent substantial nozzle erosion. Hence, such results cannot be obvious since they have required considerable amounts of both experimental and theoretical research.”

(C) Rejection of Claims 13, 26, 39 and 52 Under §103(a) As Being Obvious Over Katz And In View of Massa et al.

The Applicants respectfully argue that the Examiner commits clear error in this rejection because:

The Examiner's logic of "Katz discloses the claimed invention ... (but) not .. using electric discharge machining ... (which is disclosed by Massa et al.)" is erroneous because, as explained above, with regard to the §102(b) rejection, Katz does not anticipate or disclose the basic invention that is claimed in this application's independent claims.

Thus, regardless of whether Massa et al. discloses the additional limitations of Claims 13, 26, 39 and 52, the cited combinations cannot make the invention claimed in dependent claims 13, 26, 39 and 52 obvious because Katz does not disclose the basic invention claimed in the independent Claims 1, 14, 27 and 40 from which these claims depend.

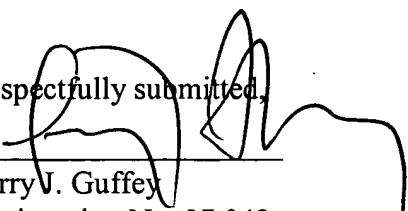
IV. Arguments For The Allowability of the Amended Claims 13, 26, 39 and 52

The Applicants respectfully note that the amended Claims 13, 26, 39 and 52 should clearly be allowable if the Examiner admits that the arguments given above are valid as to why the initial §103(a) rejections of the original Claims 13, 26, 39 and 52 should be withdrawn. The logic behind this reasoning is that these amended claims only add a further limitation which, because it was discovered as a result of the Inventors' recent extensive experiments, is highly unlikely to be found in the prior art.

CONCLUSION

In view of the foregoing amendments and arguments, Applicants respectfully request that the earlier rejection of Claims 1-52 be reversed and that now amended Claims 13, 26, 39 and 52, along with the remaining original Claims be allowed.

Respectfully submitted,



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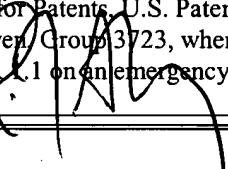
ATTORNEY FOR APPLICANT

4/30/03

Date

CERTIFICATE OF MAILING

I hereby certify that this correspondence, and attachments, if any, will be deposited with United States Postal Service, First Class Mail, postage prepaid, on the date indicated above and will be addressed to the Assistant Commissioner for Patents, U.S. Patent & Trademark Office, P.O. Box 2327, Arlington, VA 22202, ATTN: Examiner Nguyen, Group 3723, wherein it is to be understood that this address is being used in place of that set forth in 37 CFR 1.1 on an emergency basis as directed in the USPTO's 11/20/01 directive on this matter.

Signature: 

Date of Deposit: 4/30/03

Application No.: 10/010,663

Filed: December 6, 2001

For: Porous, Lubricated Mixing Tube For Abrasive, Fluid Jet

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

The claims have been amended as follows:

13. (First Amendment) An abrasive, fluid jet cutting apparatus as recited in claim 12, wherein the mixing tube passage connecting its inlet and outlet ports is made by using electric discharge machining to machine said porous material, and

wherein the porous material for use in fabricating said mixing tube and the operating parameters for said electric discharge machining of said mixing tube passage are chosen so as to yield minimum blocking of the pores on the machined surface of said mixing tube passage.

26. (First Amendment) A method for reducing erosion on the inner wall of said mixing tube as recited in claim 25, wherein the mixing tube passage connecting its inlet and outlet ports is made by using electric discharge machining to machine said porous material, and

wherein the porous material for use in fabricating said mixing tube and the operating parameters for said electric discharge machining of said mixing tube passage are chosen so as to yield minimum blocking of the pores on the machined surface of said mixing tube passage.

39. (First Amendment) A mixing tube apparatus as recited in claim 38, wherein the mixing tube passage connecting its inlet and outlet ports is made by using electric discharge machining to machine said porous material, and

wherein the porous material for use in fabricating said mixing tube and the operating parameters for said electric discharge machining of said mixing tube passage are chosen so as to yield minimum blocking of the pores on the machined surface of said mixing tube passage.

52. (First Amendment) A mixing tube as recited in claim 51, wherein the mixing tube passage connecting its inlet and outlet ports is made by using electric discharge machining to machine said porous material, and

wherein the porous material for use in fabricating said mixing tube and the operating parameters for said electric discharge machining of said mixing tube passage are chosen so as to yield minimum blocking of the pores on the machined surface of said mixing tube passage.